Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

1. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(c) comparing the calculated flux-linkage λ_{ph} with a reference flux-linkage λ_r, the reference flux-linkage λ_r related to a reference angle θ_r which lies between angles corresponding to aligned rotor position and non-aligned rotor position in the motor; and

(d) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next active phase, based on a timing at which the calculated flux-linkage λ_{ph} becomes greater than the reference flux-linkage λ_r.

2. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) calculating an estimated rotor position θ_{est} by adding up an incremental rotor angle $\Delta\theta$ every predetermined control period;

(b) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(c) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(d) comparing the calculated flux-linkage λ_{ph} with a reference flux-linkage λ_r, the reference flux-linkage λ_r related to a reference angle θ_r which lies between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(e) when the calculated flux-linkage λ_{ph} becomes greater than the reference flux-linkage λ_r during the active conduction of a phase, performing once the following procedures including,

(a_1) determining estimated rotor position information θ_{cal} which is set at the reference angle θ_r related to the flux-linkage λ_r, or

(a_2) determining estimated rotor position information θ_{cal} from the flux-linkage λ_{ph} by using either one of a predetermined flux-linkage model or inductance model, or

(a_3) determining estimated rotor position information θ_{cal} by adding a correction angle Φ to the reference angle θ_r related to the flux-linkage λ_r; and

(b) calculating an absolute rotor position θ_{abs} by adding the estimated rotor position information θ_{cal} to a stoke angle of the motor, and

(c) determining and updating the incremental rotor angle $\Delta\theta$ by processing an error between the absolute rotor position θ_{abs} and the estimated rotor position θ_{est} through either one of a proportional-integral control and a proportional control; and

(f) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next active phase based on the estimated rotor position θ_{est}.

3. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(c) comparing the calculated flux-linkage λ_{ph} with a reference flux-linkage λ_r, the reference flux-linkage λ_r related to a reference angle θ_r which lies between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(d) when the calculated flux-linkage λ_{ph} becomes greater than the reference flux-linkage λ_r during the active conduction of a phase, performing once the following procedures including,

(a) determining estimated rotor position information θ_{cal} which is set at the reference angle θ_r related to the flux-linkage λ_r;

(b) calculating and updating an incremental rotor angle $\Delta\theta$ by using an elapsed time from the instant at which the estimated rotor position information θ_{cal} in the previous cycle is determined; and

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next phase, based on the incremental rotor angle $\Delta\theta$, and the turn-off delay and turn-on delay relating to the reference angle θ_r.

4. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(c) comparing the calculated flux-linkage λ_{ph} with a reference flux-linkage λ_r, the reference flux-linkage λ_r related to a reference angle θ_r which lies between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(d) when the calculated flux-linkage λ_{ph} becomes greater than the reference flux-linkage λ_r during the active conduction of a phase, performing once the following procedures including,

(a_1) determining estimated rotor position information θ_{cal} from the flux-linkage λ_{ph} by using either one of a predetermined flux-linkage model and inductance model, or

(a_2) determining estimated rotor position information θ_{cal} by adding a correction angle Φ to the reference angle θ_r related to the flux-linkage λ_r; and

(b) calculating and updating an incremental rotor angle $\Delta\theta$ by using an elapsed time from the instant at which the estimated rotor position information θ_{cal} in the previous cycle is determined; and

(c) correcting a turn-on delay and a turn-off delay which are related to the reference angle θ_r based on the estimated rotor position information θ_{cal}; and

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next phase, based on the incremental rotor angle $\Delta\theta$, and the corrected turn-off and turn-on delays.

5. (Cancelled)

6. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) calculating an estimated rotor position θ_{est} by adding up an incremental rotor angle $\Delta\theta$ every predetermined control period;

(b) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(c) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(d) comparing the calculated flux-linkage λ_{ph} with a plurality of reference flux-linkages λ_{rn} (n=1,..,k), each of the reference flux-linkages λ_{rn} (n=1,..,k) related to each of reference angles θ_{rn} (n=1,..,k) which lie between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(e) each time the calculated flux-linkage λ_{ph} becomes greater than each of the reference flux-linkages λ_{rn} during the active conduction of a phase, performing once the following procedures including,

(a_1) determining estimated rotor position information θ_{caln} (n=1,..,k) which is set at the reference angle θ_{rn} related to the flux-linkages λ_{rn}, or

(a_2) determining estimated rotor position information θ_{caln} (n=1,..,k) from the flux-linkage λ_{ph} by using either one of a predetermined flux-linkage model or inductance model, or

(a_3) determining estimated rotor position information θ_{caln} (n=1,..,k) by adding a correction angle Φ to the reference angle θ_{rn} related to the flux-linkages λ_{rn}; and

(b) calculating an absolute rotor position θ_{abs} by adding the estimated rotor position information θ_{caln} to a stoke angle of the motor, and

(c) determining and updating the incremental rotor angle $\Delta\theta$ by processing an error between the absolute rotor position θ_{abs} and the estimated rotor position θ_{est} through either one of a proportional-integral control and a proportional control; and

(f) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next active phase based on the estimated rotor position θ_{est}.

7. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(c) comparing the calculated flux-linkage λ_{ph} with a plurality of reference flux-linkages λ_r (n=1,..,k), each of the reference flux-linkages λ_r (n=1,..,k) related to each of reference angles θ_r (n=1,..,k) which lie between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(d) each time the calculated flux-linkage λ_{ph} becomes greater than each of the reference flux-linkages λ_{rn} during the active conduction of a phase, performing once the following procedures including,

(a) determining estimated rotor position information θ_{caln} (n=1,..,k) which is set at the reference angle θ_{rn} related to the flux-linkages λ_{rn};

(b) calculating and updating an incremental rotor angle $\Delta\theta_n$ (n=1,..,k) by using an elapsed time from the instant at which the estimated rotor position information θ_{caln} in the previous cycle is determined;

(c) when the calculated flux-linkage λ_{ph} becomes greater than the maximum reference flux-linkage λ_{rk}, averaging the incremental rotor angles $\Delta\theta_n$ (n=1,..,k) to determine and update an incremental rotor angle $\Delta\theta$; and

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next phase, based on the incremental rotor angle $\Delta\theta$, and turn-off delay and turn-on delay related to the reference angle θ_{rn} (n=1,..,k).

8. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(c) comparing the calculated flux-linkage λ_{ph} with a plurality of reference flux-linkages λ_{rn} (n=1,..,k), each of the reference flux-linkages λ_{rn} related to each of reference angles θ_{rn} (n=1,..,k) which lie between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(d) each time the calculated flux-linkage λ_{ph} becomes greater than each of the reference flux-linkages λ_{rn} during the active conduction of a phase, performing once the following procedures including,

(a) determining estimated rotor position information θ_{caln} (n=1,..,k) from the flux-linkage λ_{ph} by using either one of a predetermined flux-linkage model and inductance model,

(b) calculating and updating an incremental rotor angle $\Delta\theta$ by using an elapsed time from the instant at which the estimated rotor position information θ_{caln} in the previous cycle is determined,

(c) when the calculated flux-linkage λ_{ph} becomes greater than the maximum reference flux-linkage λ_{rk}, averaging the incremental rotor angles $\Delta\theta_n$ (n=1,..,k) to determine and update an incremental rotor angle $\Delta\theta$, and

(d) correcting a turn-on delay and turn-off delay which are related to the reference flux-linkages λ_{rn}, based on the estimated rotor position information θ_{caln}; and

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next phase, based on the incremental rotor angle $\Delta\theta$, and the corrected turn-off and turn-on delays.

9. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating a flux-linkage λ_{ph} of an active phase from the sensed d.c.-link voltage V_{dc} and the sensed phase current I_{ph};

(c) comparing the calculated flux-linkage λ_{ph} with a plurality of reference flux-linkages λ_{rn} (n=1,..,k), each of the reference flux-linkage λ_{rn} (n=1,..,k) related to each of reference angles θ_{rn} (n=1,..,k) which lie between angles corresponding to aligned rotor position and non-aligned rotor position in the motor;

(d) each time the calculated flux-linkage λ_{ph} becomes greater than each of the reference flux-linkages λ_{rn} during the active conduction of a phase, performing once the following procedures including,

(a) determining estimated rotor position information θ_{caln} (n=1,..,k) by adding a correction angle Φ to the reference angle θ_{rn} related to the reference flux-linkages λ_{rn},

(b) calculating an incremental rotor angle $\Delta\theta_n$ (n=1,..,k) by using an elapsed time from the instant at which the estimated rotor position information θ_{caln} in the previous cycle is determined, and

(c) when the calculated flux-linkage λ_{ph} becomes greater than the maximum reference flux-linkage λ_{rk}, averaging the incremental rotor angles $\Delta\theta_n$ (n=1,..,k) to determine and update an incremental rotor angle $\Delta\theta$;

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next phase, based on the incremental rotor angle $\Delta\theta$, and a turn-off delay and a turn-on delay which are determined according to the reference angle θ_{rn}.

10. (Cancelled)

11. (Cancelled)

12. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) calculating an estimated rotor position θ_{est} by adding up an incremental rotor angle $\Delta\theta$ every predetermined control period;

(b) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(c) calculating an estimated current I_s from the sensed d.c.-link voltage V_{dc}, the sensed phase current I_{ph}, and a value completely or approximately equal to the minimum value of a motor inductance;

(d) comparing the sensed phase current I_{ph} with the estimated current I_s; and

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next active phase, based on a timing when an error between the sensed phase current I_{ph} and the estimated current I_s becomes equal to or less than a predetermined value.

13. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) calculating an estimated rotor position θ_{est} by adding up an incremental rotor angle $\Delta\theta$ every predetermined control period;

(b) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(c) calculating an estimated current I_s from the sensed d.c.-link voltage V_{dc}, the sensed phase current I_{ph}, and a value completely or approximately equal to the minimum value of a motor inductance;

(d) comparing the sensed phase current I_{ph} with the estimated current I_s;

(e) when an error between the sensed phase current I_{ph} and the estimated current I_s becomes equal to or less than a predetermined value, performing once the following procedures including,

(a) determining a rotor position θ_{app} which is related to the estimated current I_s in advance,

(b) calculating an absolute rotor position θ_{abs} by adding the rotor position θ_{app} to a stoke angle of the motor, and

(c) determining and updating the incremental rotor angle $\Delta\theta$ by processing an error between the absolute rotor position θ_{abs} and the estimated rotor position θ_{est} through either one of a proportional-integral control and a proportional control; and

(f) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next active phase, based on the estimated rotor position θ_{est}.

14. (Previously Presented) A control method of a switched reluctance motor comprising:

(a) sensing a d.c.-link voltage V_{dc} and a phase current I_{ph};

(b) calculating an estimated current I_s from the sensed d.c.-link voltage V_{dc}, the sensed phase current I_{ph}, and a value completely or approximately equal to the minimum value of the motor inductance;

(c) comparing the sensed phase current I_{ph} with the estimated current I_s;

(d) when an error between the sensed phase current I_{ph} and the estimated current I_s becomes equal to or less than a predetermined value, performing once the following procedures including,

(a) determining a rotor position θ_{app} which is related to the estimated current I_s in advance;

(b) calculating and updating an incremental rotor angle $\Delta\theta$ by using an elapsed time from the instant at which the rotor position θ_{app} in the previous cycle is determined; and

(e) controlling a turn-off angle θ_{off} of each active phase and a turn-on angle θ_{on} of the next active phase, based on the incremental rotor angle $\Delta\theta$, and a turn-off delay and a turn-on delay which are related to the rotor position θ_{app}.

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Previously Presented) An apparatus which is controlled in the method according to any one of claims 1 to 4, 6 to 9, 12 to 14.

19. (Cancelled)

20. (Cancelled)

Respectfully submitted,

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LEA/dlm

Dated: May 26, 2005

The Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. **18-0350** of any fees associated with this communication.

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Kathleen Libby

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